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# Chapter 13. Surface Storage — CALFED

## CALFED Surface Storage in California

The CALFED Record of Decision (2000) identified five potential surface storage reservoirs that are being investigated by the California Department of Water Resources, U.S. Bureau of Reclamation (USBR), and local water interests:

- Shasta Lake Water Resources Investigation (SLWRI) – Draft Feasibility Report released February 2012/Draft EIS released June 2013.
- North-of-the-Delta Offstream Storage (NODOS) – Draft Feasibility Report and Draft EIR/EIS to be released early 2014.
- In-Delta Storage Project (IDSP) – Delta Wetlands Project – Draft EIR 4/2010.
- Los Vaqueros Reservoir Expansion (LVE).
- Upper San Joaquin River Basin Storage Investigation (USJRBSI).

The following summary provides a snapshot of the current status of the five CALFED Surface Storage Investigations. Additional information is at <http://www.water.ca.gov/storage/index.cfm>. The general locations of the initial alternatives reflected in the summary below are shown in Figure 13-1, General Location of CALFED Surface Storage Initial Alternatives.

### PLACEHOLDER Figure 13-1 General Location of CALFED Surface Storage Initial Alternatives

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the chapter.]

#### COMMENT:

Ensure that there is enough discussion of previous process and analysis that a lay person could understand how we have narrowed the possibilities to the ones discuss. Cannot assume that everybody knows this. Give legislators a sense of the process that narrowed these down.

Provide a simple clear message that above ground storage and below ground storage work together and not independently to maximize storage.

Include work of California Water Commission.

The 2009 Comprehensive Water Package includes a water bond that may provide a portion of the financing to construct one or more CALFED surface storage projects. The Safe, Clean, and Reliable Drinking Water Supply Act has been delayed until 2014, but may include up to \$3 billion for storage that improves operations of the statewide water system. This public money would be used to invest in public benefits including ecosystem restoration, flood management, water quality, emergency response, and

**Comment [jw1]:** This chapter will be updated with information from planning documents as it becomes available. I have noted below several areas that will likely be updated.

JW: addressed

recreation. According to the bond proposal, water supply reliability benefits for urban or agricultural users would be paid for by those beneficiaries.

Water resources planning has changed significantly over the past several decades. New approaches to planning for CALFED surface storage has resulted in a new era of project formulations designed to address a new era of water resources needs. The State and federal governments have funded the five surface storage investigations, which were explicitly conceived to support at least three of CALFED's program objectives: water supply reliability, water quality, and ecosystem restoration. From the outset, investigation planners acknowledged that the dam building model of the past (i.e., onstream reservoirs built primarily for agricultural and urban users and flood protection) would not be helpful in solving California's current water challenges. In fact, these approaches would likely exacerbate many of the state's water resources problems, especially perceptions about winning and losing in California's water battles. Consequently, CALFED considered new onstream storage untenable. Offstream storage or expansion of existing storage proposals were considered, but formulations would emphasize effective mitigation of impacts. In addition, these new proposals would not limit consideration of environmental effects to mitigation, but instead would be designed to improve environmental conditions. Project purposes emphasize multi-objective storage, combining newer objectives associated with ecosystem restoration and water quality with more traditional purposes of water supply reliability, hydropower, and flood control. More specifically, these new projects would support aquatic ecosystem restoration focused on the Delta and its tributaries, improved drinking and habitat water quality, and water supply reliability improvements that ultimately support California's growing population and diverse economy.

The CALFED surface storage project formulations have dedicated significant project resources to public benefits including ecosystem restoration, water quality, and water supply reliability for environmental uses (e.g., refuge water supply) (see Table 13-1 CALFED Surface Storage Initial Alternatives Benefits Summary) that would be paid for by the State and/or federal governments. Contributions to a reliable water supply are also explicitly included. Urban and agricultural water supply reliability is considered a non-public benefit that would be paid for by water retailers and users. In addition, tribes could be potential beneficiaries of the projects. Tribes may have interest in any of the benefits previously listed including urban, environmental, and agricultural supply reliability, drinking and habitat water quality, and ecosystem restoration.

#### **PLACEHOLDER Table 13-1 CALFED Surface Storage 2010 Progress Report Benefit Summary**

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the chapter.]

California's water resources future has become increasingly uncertain. Consequently, these projects will need to perform well under a number of potential future conditions including climate change, alternative Delta conveyance and management, and disaster/emergency response. Sensitivity analyses will determine a project's effectiveness as precipitation and runoff patterns change and sea level rises, with either existing or new Delta conveyance and management and potential implementation of multiple storage facilities. Storage should also support adaptively managed restoration approaches based on new or improved science, changes in the viability of species, and modified restoration priorities. While flexibility may be challenging to value, a robust response to various future scenarios will help ensure that projects would remain "no-regrets" investments.

The continuing CALFED Surface Storage Investigations are in their final phase of planning. Funding for In-Delta Storage ended in fiscal year 2005; the four remaining investigations are ongoing. State funding for State agencies to participate in the Shasta Lake investigation also ended in fiscal year 2005. DWR and the USBR are coordinating planning assumptions and documents with the Bay Delta Conservation Plan (BDGP) and Delta Habitat Conservation and Conveyance Program (DHCCP) so that potential future changes to Delta conveyance can be appropriately incorporated into surface storage planning. DWR and USBR plan significant outreach and stakeholder input throughout this final phase, especially during the comment period of the environmental documents. Planning requirements for large surface storage projects are extensive. A more comprehensive listing of regulatory permits and compliances that would likely be required, as compiled by one of the investigations is shown in Tables 13-2 and 13-3.

#### **PLACEHOLDER Table 13-2 Primary Environmental Permits/Compliance Issues**

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the chapter.]

#### **PLACEHOLDER Table 13-3 Primary Cultural Resource Permits/Compliance Issues**

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the chapter.]

### **Potential Benefits**

The size and location of these surface storage projects facilitates accomplishing water resources benefits in two distinct ways. First, many benefits are achieved directly by releases from new storage. Second, additional storage can provide significant system flexibility such that other facilities' operations can be modified without reducing current benefits to support additional benefits within the system. Additional water in storage can be used either to improve ecosystem functions and conditions for targeted species, or to improve water quality or supply reliability for water users. Another important characteristic of these proposals is the geographic location of the benefits. A number of the environmental benefits occur within the Sacramento-San Joaquin Delta. Other environmental benefits are targeted at the Delta's tributaries including the Sacramento and San Joaquin rivers and other rivers downstream of existing reservoirs, recognizing the direct connections between tributary and estuarine health. Water supply reliability improvements are generally for State Water Project (SWP) and Central Valley Project (CVP) contractors or environmental uses (i.e. refuges).

Performance of the CALFED surface storage projects is measured using an operations simulation of the Central Valley Project and State Water Project systems, using the historic hydrologic sequence 1922-2003 run through a simulation model of the water projects (CALSIM II). CALSIM II provides detailed information related to operations of the system under with and without project conditions. Results are often reported with both average annual values and driest periods average annual values, reflecting the importance of performance under dry and drought conditions. Drought performance has become increasingly important, as water managers and decision-makers acknowledge challenges California will face with future drought conditions. This type of comprehensive analysis allows investigators to determine how much water from a proposed project will be used to meet needs that would not be met without the project. In addition, DWR and USBR have developed a suite of analytical tools that are used in a coordinated manner with the operations simulation to assess other important characteristics including Delta water quality, Sacramento River temperature, water quality, fishery effects, river meander, sediment

**Comment [jw2]:** introduce and describe 2010 CALFED SSI Progress Report info and data

JW: addressed

transport, riparian success, and water resources economics. DWR, USBR, and other agencies have developed a Common Assumptions process that establishes a common set of analytical tools, operations, planning assumptions, and reporting metrics so that projects are evaluated with a common foundation.

In 2010, DWR, in coordination with Reclamation and Contra Costa Water District, published the CALFED Surface Storage Investigations Progress Report. Some detail associated with specific benefits is shown in Table 13-1 CALFED Surface Storage 2010 Progress Report Benefits Summary. An initial alternative from each investigation is described here and in Table 13-4, CALFED Surface Storage 2010 Progress Report Cost Summary. These initial alternatives are not feasibility or environmental documentation alternatives and are not necessarily the preferred alternative. However, the initial alternatives described here are being and have been used to inform the formulation of alternatives for feasibility and environmental documents that are now in development. The Progress Report did not evaluate an In-Delta Storage initial formulation. Consequently, a 2004 DWR State feasibility study report for the In-Delta Storage Program and a 2006 draft supplemental report is used for In-Delta information shown in the tables. No additional State or federal funding for the program has been received since 2006. Consequently, study results are not consistent with the Common Assumptions being used by the other CALFED Surface Storage Investigations. The In-Delta storage reports are available at <http://www.water.ca.gov/storage/indelta/index.cfm>.

Comment [jw3]: update benefits

JW: addressed

Comment [jw4]: update costs

JW: addressed

## Potential Costs

Costs have been estimated for an initial alternative for each of the CALFED Surface Storage Investigations. The costs shown in Table 13-4 reflect the same initial formulation as described in the Potential Benefits section above so that benefits and costs can be considered together. As noted previously, the initial formulations shown here are not necessarily the preferred alternative, but will be used to inform the alternatives that will be selected and analyzed in the environmental and feasibility planning documents. Costs and benefits are shown as they are reported in Progress Report or the In-Delta reports. The older In-Delta studies have not been updated to reflect same date comparisons of the four investigations reported on in the Progress Report. Table 13-4 shows the storage capacity and capital cost. Costs of the initial formulations shown range from \$789 million to \$3.6 billion. Costs would be allocated to benefits based upon the amount of project resources necessary to support each benefit type and the value of the benefits. Benefits provided to the public would be paid for by federal and/or State funding sources. The remaining portion of the cost of each project would then need to be paid for by local and regional water interests. In these initial formulations, the local and regional water interests are primarily considered to be the contractors of the CVP and SWP.

### PLACEHOLDER Table 13-4 CALFED Surface Storage Initial Alternatives Cost Summary

[Any draft tables, figures, and boxes that accompany this text for the public review draft are included at the end of the chapter.]

## Major Implementation Issues

### Climate Change

Climate models project that average temperatures are expected to continue to rise by the end of this century. With warmer temperatures, it is anticipated that more precipitation will fall as rain instead of snow, and snow levels will shift to higher elevations, reducing the total snowpack. In the past few years,

there has been a gradual shift in snowpack and runoff timing in California; runoff is now occurring earlier in the year than it has historically.

Although climate temperature models have a higher degree of certainty, it is not fully understood how precipitation will be affected by climate change. Climate precipitation models project little change in precipitation in California before 2050 and projections past 2050 suggest even more uncertainty with either more or less precipitation. SWP and CVP operations are particularly sensitive to precipitation, reservoir carryover storage levels, demand, and Delta exports. Existing system vulnerabilities intensified by a changing climate will potentially reduce water management flexibility, supply, and delivery capability, ultimately changing Delta exports.

### Mitigation

Energy intensity of surface storage could be different depending on net energy input or energy used for construction and maintenance. Surface storage projects could also have some climate change impacts on watershed ecosystems and water quality related to greenhouse gas (GHG) emissions, however, these impacts are not well defined due to project-related uncertainty. Energy use and generation should be defined to evaluate energy benefit with hydropower and net energy production.

Management strategies discussed in this chapter can be used to avoid and minimize adverse impacts on climate change related to energy use and GHG emissions:

1. Prioritizing future surface storage by assessing energy use and GHG emissions in the feasibility and environmental studies for three CALFED Surface Storage Investigations (NODOS, LVE, and USJRBSI).
2. Evaluating potential project effects and related alternatives (upgrading existing projects or developing new projects) by using climate change mitigation and reducing GHG emissions as one of the project option selection criteria.
3. Identifying public benefits in surface storage for the State and federal investment in clean energy, water quality, and ecosystem service could have mitigation potential related to energy and GHG emissions reduction.
4. Performing integrated planning with the Delta Plan, the California Water Plan (CWP) Update, and the Bay Delta Conservation Plan as well as IRWM with watershed management could provide long-term public benefits with water quality control, vegetation improvement, and ecosystem service, which could have mitigation potential related to carbon sequestration and reducing energy use and GHG emissions.
5. Planning project operations to achieve primary purposes of ecosystem restoration and water quality improvement could provide potential benefits related to carbon sequestration and reducing energy use and GHG emissions.
6. Evaluating energy efficiency and GHG emissions with other water management options such as water use efficiency, water transfers, conjunctive management, desalination, and recycling could provide opportunities for climate change mitigation.
7. Adaptation

Much of the state's infrastructure was built to capture the relatively slow spring runoff and deliver water during the summer and fall months. With anticipated changes to the snowpack and runoff timing, increased surface storage would allow greater management flexibility by capturing more runoff as it occurs. Stored runoff will help supplement snowpack capacity reduction by providing a buffer to meet

**Comment [JW5]:** Not so sure I edited this without changing the meaning. The sentence was confusing. HELP! ---JEFF

JHW: check with whoever added this

JW: I don't know who wrote this section. It was just inserted into the strategy with no coordination with me. I suggest checking with Andrew.

**Comment [JW6]:** Might be a good idea to be specific here. Adaptation by itself doesn't say much. ---JEFF

water demand under drier or wetter future climate conditions. While surface storage has the potential to address vulnerabilities immediately such as water quality and supply reliability, additional surface storage will also allow the system to respond to future climate scenarios such as extreme drought periods. While uncertainties of the state’s hydrologic future exist in current climate science, the current framework of understanding demonstrates the need for adaptive capacity and to address system vulnerabilities with additional surface storage.

## Effects

Implementation of new CALFED surface storage would affect environmental and human conditions, including economic effects to surrounding communities, as well as flow both upstream and downstream of diversions and throughout California’s water resources system. Some potential effects will be positive and some will be negative. Regulatory and permitting requirements, as listed previously, will require surface storage investigations to consider, for example, potential effects to streamflow regimes, water quality, stream geomorphology, fish and wildlife habitat, and risk of failure during seismic and operational events. In addition, agencies are developing analytical methodologies to determine GHG emissions and their contribution to climate change associated with project construction and operations. Mitigation of significant effects is required under State and federal environmental laws and is accomplished through implementation strategies that avoid, minimize, rectify, reduce over time, or compensate for negative effects. Significant input from tribes, the public, and agencies have already been received by DWR and USBR related to effects associated with potential implementation. Additional input is anticipated as feasibility and National Environmental Policy Act/California Environmental Quality Act alternatives are developed and evaluated during the final phase of the investigations.

## State and Federal Interests

A continuing essential task is the identification of State and federal interests in each of the investigations. DWR will identify public benefits (consistent with the description in the bond proposal) that warrant investment by the State. Similarly, USBR will continue to determine federal interest in projects as the federal feasibility studies are developed. In addition, DWR and USBR are working with stakeholders to identify which projects have the greatest local interest and possible willingness to pay for project costs. The CALFED Surface Storage Investigations will then use results of all these evaluations to develop federal-State-local partnerships with local and regional interests to continue refining alternatives development and plan formulations. Local and regional water entities have indicated a preference that the State and federal governments express some commitment to potential State and federal investments in the projects prior to their commitment. If partnerships are not formed (demonstrating lack of interest in advancing a project) and/or the outcome of technical and economic studies indicate any of the five projects are not feasible, the State and/or federal governments may decide to defer future studies of specific projects.

## Financing

Implementation of one or more CALFED surface storage projects would likely require multiple types of financing. The Safe, Clean, and Reliable Drinking Water Supply Act scheduled for vote in 2014 could provide general obligation bonds to pay for the public benefits portion of CALFED surface storage projects. Repayment bonds could facilitate contractor (i.e., local agencies) participation in benefits to specific water users, as has been provided in the past. Local agencies may also develop their own financing. Federal participation in the projects would potentially make them much more effective. State



and federal investment in developed water supplies dedicated to the restoration of the Delta and tributary ecosystems would give fish and wildlife managers new tools to revitalize these ecosystems proactively. Managers could then use these environmental water supplies to support water-required actions that would improve conditions for aquatic ecosystems and species that depend upon them. These dedicated restoration supplies may prove an essential element in recovery of the Delta, its tributaries, and dependent species. State and federal fish and wildlife management agencies would have the task to manage restoration water supply assets proactively and adaptively. DWR and USBR understand that these agencies and the public will want assurances that projects will be operated in a manner to protect these potential public investments. The federal government may also invest in refuge water supplies or make a capital investment in water supplies for CVP contractors.

## Recommendations to Facilitate CALFED Surface Storage Decision-making

1. CALFED signatories and stakeholders should continue to prioritize work efforts to complete the feasibility and environmental studies of the surface storage investigations.
  - A. As indicated in the funding discussion above, DWR is prioritizing future surface storage work to complete environmental documentation and feasibility analyses for three CALFED Surface Storage Investigations (NODOS, LVE, and USJRBSI). USBR is prioritizing work on four investigations (SLWRI, NODOS, LVE, and USJRBSI). Prioritization criteria include reviewing conclusions and recommendations from ongoing State and federal planning studies; determining federal, State, and local interest including willingness to pay; evaluating benefits in light of the bond proposal; and assessing legal and logistical issues related to specific projects.
  - B. Engage more stakeholders and potential project participants in the process. The investigations should continue to work with tribes, the public, and agencies in identifying, evaluating, and quantifying potential project effects (i.e., both beneficial and negative effects).
  - C. Develop information on costs, effects, and how the projects could be operated for a variety of purposes.
  - D. Continue evaluation and presentation of alternatives with uncertain potential future scenarios, including alternative Delta conveyance and operations and climate change effects that allow potential participants to assess their interest in specific projects.
  - E. Develop mechanisms to provide assurances that these projects should be operated in a manner consistent with the objectives.
  - F. Assess tribal, federal, State, and local interest in the investigations, including opportunities for State and federal investment in public benefits.
  - G. The investigations should coordinate with IRWM efforts.
2. DWR, USBR, other state and federal agencies, and local interests should continue work with related planning efforts including Delta Vision, the CWP Update, and the Bay Delta Conservation Plan.
3. DWR and USBR should continue their development of conceptual finance plans that include descriptions of relevant State and federal financial policies and a determination of the potential for State and federal investment in benefits to the general public. The scenarios and finance plans may help facilitate potential investment discussions and then decisions by the public as well as local, regional, State and federal decision-makers.

## Linkages to Other Strategies

The CALFED Surface Storage Investigations are inclusive of a number of other strategies in their formulations. As stated previously, ecosystem restoration and water quality are explicitly included as primary purposes of several investigations. Accomplishments related to ecosystem restoration and water quality are achieved by dedication of developed water to these purposes. Other strategies are included as secondary purposes of the surface storage investigations such as flood management and water-dependent recreation. A major conceptual component of these investigations is related to how these new facilities would be integrated into the existing water resources systems, especially the CVP and SWP systems. In each investigation, new storage integrated into these systems provides unique opportunities to provide benefits associated with system re-operation. In many cases, the existing facilities can be operated in a more efficient manner with additional storage. These re-operative approaches are described in greater detail in each investigation's most recent planning documents.

The CALFED Surface Storage Investigations are also incorporating many other strategies into their planning. For example, a cooperative and collaborative Common Assumptions process has led to agreed-upon assumptions associated with future strategy implementations including agricultural and urban water use efficiency, Delta conveyance, water transfers, conjunctive management, desalination, and recycled municipal water. The CALFED Surface Storage Investigations is one of just a few strategies that assume increased implementation of other strategies in its planning estimates shown in CWP. For example, the common assumptions include increased water use efficiency, water transfers, conjunctive management, desalination, and recycling. The Common Assumptions process and assumptions are described in each investigation's current planning documents.

*California Water Plan Update 2005* and *California Water Plan Update 2009* provided a planning roadmap with two initiatives for achieving sustainable and reliable water supplies for California through 2030. The CALFED Surface Storage Investigations fall naturally in the Improve Statewide Water Management Systems initiative since the investigations seek to integrate with the Central Valley Project and the State Water Project, California's largest water systems. The second initiative, implementation of IRWM, is also essential to California's water resources future. Many of the surface storage investigations' purposes also need to be integrated with local and regional planning efforts. Ecosystem restoration, water quality, and improved regional and local supplies all need to be incorporated into local and regional planning. The new era approach by the CALFED Surface Storage Investigations is very similar to the approach now being promoted through IRWM.

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**Table 13-1 CALFED Surface Storage 2010 Progress Report Benefit Summary**

Investigation (Reservoir Initial Formulation Shown) <sup>a</sup>	New Storage Capacity (taf <sup>b</sup> )	Average Annual Yield (taf <sup>b</sup> /year)	Drought Yield <sup>c</sup>	Yield Estimate Includes	Benefits Not Included in Yield Estimate
Los Vaqueros Expansion	115	13 147	3 86	Water supply <sup>d</sup> Ecosystem (diversion through new fish screens)	Emergency Water Supply Water Quality
North-of-the-Delta Offstream Storage (Sites Reservoir)	1,800	<u>560</u> 183 197 180	387 209 112 66	<u>Total</u> Water supply Water Quality Ecosystem Restoration	Flexible Hydropower Generation Recreation Flood Damage Reduction
Shasta Lake Water Resources	634	74	71	Total to be distributed to water supply, ecosystem restoration, and water quality	Dedicated storage for anadromous fish Hydropower Recreation
Upper San Joaquin River Basin Storage (Temperance Flat RM 274)	1,260	140	86	Total to be distributed to water supply, ecosystem restoration, and water quality	Flood Damage Reduction Hydropower Recreation Ecosystem Restoration Water Quality Emergency Water Supply
In-Delta Storage <sup>e</sup>	217	<u>107</u> 30 18 13 2 44		<u>Total</u> Urban + Ag Groundwater Banking Ecosystem Restoration Refuge Water Quality	Ecosystem Restoration (non flow-related)

## Notes:

<sup>a</sup> Initial Investigation Formulations are from the 2010 CALFED Surface Storage Investigations Progress Report, unless noted, and are not feasibility or environmental document alternatives.

<sup>b</sup> taf = thousand acre-feet

<sup>c</sup> Drought yield is the average annual yield associated with the driest periods, which include 1928 -1934, 1976 -1977, and 1986 – 1992

<sup>d</sup> Water supply may include municipal & industrial, agricultural, and refuge water supply reliability improvements

<sup>e</sup> In-Delta Storage information was compiled from 2004 Draft – State Feasibility Study and 2006 Supplemental Report of the In-Delta Storage Project

**Table 13-2 Primary Environmental Permits/Compliance Issues**

<b>State</b>
Department of Fish and Game Code Sections:
5937-Water Diversions and Fish
3511-Fully Protected Birds
4700-Fully Protected Mammals
3503-Specified Birds
3505-Eggs and Nests
3503.5-Birds of Prey
Department of Fish and Game Streambed Alteration Agreement
California Environmental Quality Act
California Endangered Species Act
California Water Rights
Executive Order 12898-Environmental Justice
Executive Order 11990-Wetlands Protection
Natural Community Conservation Planning Act
Native Plant Protection Act
Regional Water Quality Control Board Storm-water Permit
<b>Federal</b>
1899 Rivers and Harbors Act
Energy Regulatory Commission License
Fish and Wildlife Coordination Act
Migratory Bird Treaty Act
National Environmental Policy Act
Clean Water Act Sections 404 and 401
<b>Other</b>
Local Permits and Compliances
Public Trust Doctrine

**Table 13-3 Primary Cultural Resource Permits/Compliance Issues**

<b>Federal</b>
American Indian Religious Freedom Act of 1978 (42 USC 1996)
Archaeological and Historic Preservation Act of 1974 (16 USC 469)
Archaeological Resource Protection Act of 1979 (16 USC. 470)
Archeology and Historic Preservation: Secretary of the Interior's Standards and Guidelines (48 CFR 44716)
Determination of Eligibility for Inclusions in the National Register of Historic Places (36 CFR Part 63)
National Historic Preservation Act of 1966(16 USC 470, Section 106)
National Register of Historic Places (36 CFR Part 60)
Native American Graves Protection and Repatriation Act of 1990 (25 USC 3001)
Protection of Archaeological Resources: Uniform Regulations (43 CFR 7)
Protection of Cultural and Historic Properties (36 CFR Part 800)
Reclamation Cultural Resources Directives and Standards LND 02-01
Reclamation Cultural Resources Management Policy LND-P01
<b>State</b>
California Environmental Quality Act (Public Resources Code Sections 21083.2 and 21084.1, and Section 15064.5 of the CEQA Guidelines)
California Health and Safety Code (Section 7070.5(b))

**Table 13-4 CALFED Surface Storage 2010 Progress Report <sup>a</sup> Cost Summary**

<b>Investigation (Reservoir Initial Formulation Shown Here)</b>	<b>New Storage Capacity of Initial Project Formulation (taf <sup>b</sup>)</b>	<b>Cost (\$ Million)</b>
Los Vaqueros Expansion	115	N/A <sup>c</sup>
North-of-the-Delta Offstream Storage (Sites Reservoir)	1,800	\$3,620
Shasta Lake Water Resources	634	\$942
Upper San Joaquin Basin Storage (Temperance Flat RM 274)	1,260	\$3,360
In-Delta Storage <sup>d</sup>	217	\$789

## Notes:

<sup>a</sup> Initial Investigation Formulations are from the 2010 CALFED Surface Storage Investigations Progress Report, unless noted, and are not feasibility or environmental document alternatives.

<sup>b</sup> taf = thousand acre-feet.

<sup>c</sup> Not available.

<sup>d</sup> In-Delta Storage information was compiled from 2004 Draft – State Feasibility Study and 2006 Supplemental Report of the In-Delta Storage Project.

**Figure 13-1 General Location of CALFED Surface Storage Initial Alternatives**

